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This paper describes a representation and a set of inference methods that combine logic programming techniques with probabilistic network representations for uncertainty (influence diagrams). The techniques emphasize the dynamic construction and solution of probabilistic and decision-theoretic models for complex and uncertain domains. Geven a query, a logical proof is produced if possible; if not, an influence diagram based on the query and the knowledge of the decision domain is produced and subsequently solved. A uniform declarative, first-order knowledge representation is combined with a set of integrated inference procedures for logical, probabilistic, and decision-theoretic reasoning.

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Decision Tree Induction Systems: A Bayesian Analysis

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Decision tree induction systems are being used for knowledge acquisition. Yet they have been developed without proper regard for the subjective Bayesian theory of inductive inference. This paper examines the problem tackled by these systems from the Bayesian view in order to interpret the systems and the heuristic methods they use. It is shown that decision tree systems depart from the usual Bayesian methods by implicitly incorporating prior belief that the simpler of two hypotheses will be preferred, all else being equal. They perform a greedy search of the space of rules to find one in which there is strong posterior belief.

The Automatic Training of Rule Bases that Use Numerical Uncertainty Representations

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The use of numerical uncertainty representations allows better modeling of some aspects of human evidential reasoning. It also makes knowledge acquisition and system development, test, and modification more difficult.

It is proposed that where possible the assignment and/or refinement of rule weights should be performed automatically. The authors present one approach to performing this